SMARTLAB
USB 8 CHANNELS PHOTO ISOLATOR INPUT BOARD

OPERATION MANUAL

Decision Computer Int'l. Co., Ltd.

Operations Manual USB 8 Channel Photo Isolator Input Board

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CHAPTER 1

INTRODUCTION

USB 8 channels photo isolator input board provides 8 photo couple digital input channels, and one RS232/RS422/RS485 port functions, which allow the digital input signals to be completely floated and prevent the ground loop and COM communication.

USB 8 channels photo isolator input board provides Plug and Play (PnP) features, and it is a programmable I/O interface board for PC/486, Pentium, or compatibles. The on board high speed 8051 uC provides USB functions run at 12Mbps full speed or 1.5Mbps low speed.

The USB 8 channels photo isolator input board can be connected to computer by using USB or RS232, RS422/RS485 communication links.

❖ **The features of USB 8 channels photo isolator input board are:**

- USB 2.0with Plug and Play (PnP) features.
- High speed 8051 uC core.
- Support USB ID selection to identify USB device.
- Support 8 photo couple input channels.
- Allow the photo input signals to be completely floated and prevent the ground loops.
- 8 LED correspond to 8 input ports activation status.
- By using PC817 photo couple chips.
- Allow to connect RS232 or RS422/RS485 extension board with DB9 connector to control.

- Power supplied from USB or external DC +5V/3A.
- 5000V isolation voltage.
- Maximum load voltage is 30V.
- Maximum 50mA forward input current.
- Input voltage range from 0V to 30V.
- Activation voltage of photo input:
  When short jumpers (input range from 0 to 20V DC)
  0 to 3.3V inactive
  4.5 to 20V active
  When open jumpers (input range from 0 to 30V DC)
  0 to 17.6V inactive
  18 to 30V active
- Suitable for Linux, MS/Windows ... etc.
- Operating temperature range from 0 to 33C.
- Relative humidity rage from 0 to 90%.

❖ **PACKAGE CONTENTS:**

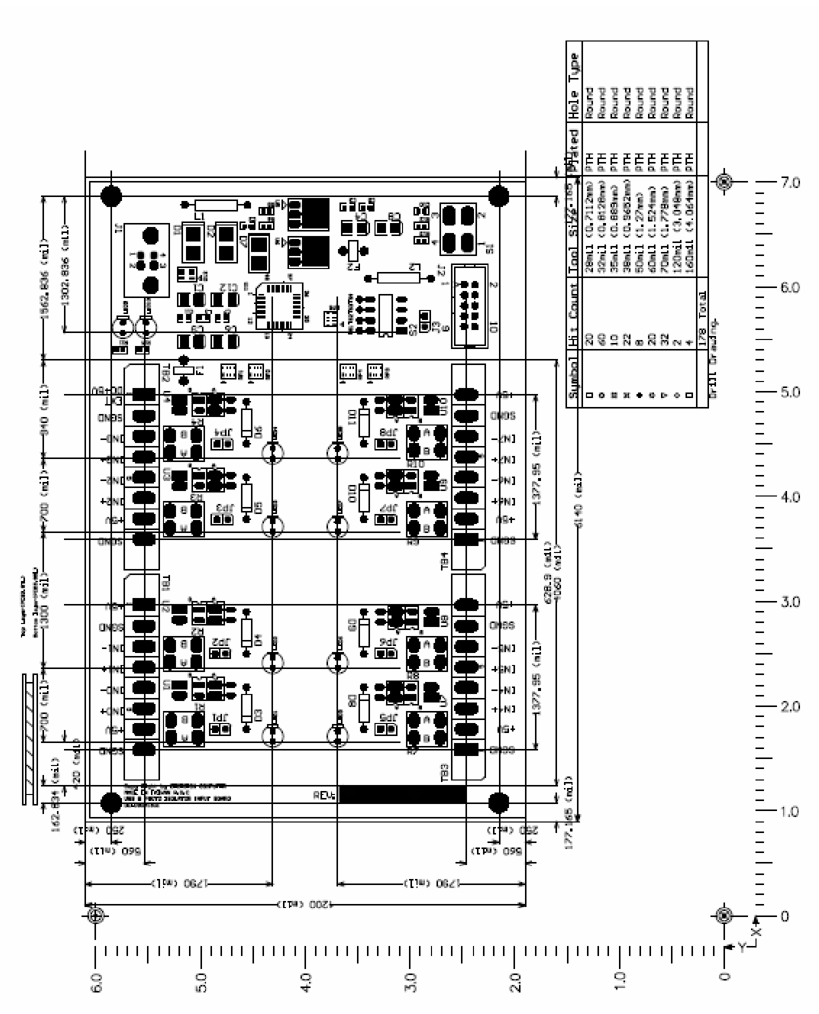
- SMARTLAB USB 8 channels photo couple input board.
- USB cable.
- Decision Studio and User's manual CD.

- Two Different Connecter Types can be selected:

  Standard: European P.C.B type terminal blocks
  Professional: Pluggable terminal blocks

Optional

- Extension board with DB9 : RS232 or RS422/485
- PCB Carrier



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CHAPTER 2

HARDWARE CONFIGURATION

Before you use USB 8 channels photo couple input board, please ensure that the jumpers and switches setting. The proper jumper and switches settings for the 8 channels photo couple input board are described in the following.

2.1 Switch Settings

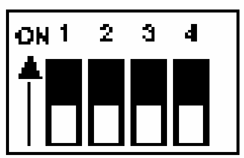
1. S1 Reset



The S1 switch is used to reset 8051, the signal assignments are shown in the following.

Pin	Signals
3,4	Reset SW+
1,2	Reset SW-

2. S2 USB ID



The S2 switch is used to identify USB board ID. Please set different board ID to each board (do not duplicate ID setting).

1	2	3	4	ID
ON	ON	ON	ON	--
OFF	ON	ON	ON	14
ON	OFF	ON	ON	13
OFF	OFF	ON	ON	12
ON	ON	OFF	ON	11
OFF	ON	OFF	ON	10
ON	OFF	OFF	ON	9
OFF	OFF	OFF	ON	8
ON	ON	ON	OFF	7
OFF	ON	ON	OFF	6
ON	OFF	ON	OFF	5
OFF	OFF	ON	OFF	4
ON	ON	OFF	OFF	3
OFF	ON	OFF	OFF	2
ON	OFF	OFF	OFF	1
OFF	OFF	OFF	OFF	0

3. Down load revised firmware

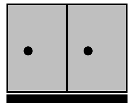
When the S2 switch is set to ON ON ON ON status, means down load revised firmware. please follow the steps shown in the following:

1. Set S2 to ON ON ON ON.
2. Run USBBootloader program to down load revised firmware.

2.2 Jumper Settings

1. Input Voltage Range Selection (JP1 to JP8)

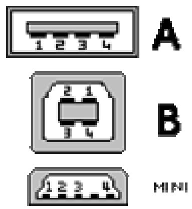
1 2



JP1 to JP8 are used to select input voltage range. The JP1 is used to select photo couple input channel 0, and JP2 is used to select photo couple input channel 1, … etc. When short the jumper, the input voltage range from 0 to 20V, and the active voltage form 4.5 to 20V. When open the jumper, the input voltage range from 0 to 30V, and the active voltage from 18 to 30V.

Jumper	Input Voltage	Inactive Voltage	Active Voltage
open	0 to 30V	0 to 17.6V	18 to 30V
short	0 to 20V	0 to 3.3V	4.5 to 20V

2.3 USB Connector



1. USB Connector
2.
The USB connector is connected to computer USB port by using USB cable.

2.4 LED Status

1. LED1

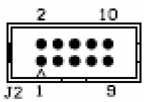
The LED1 is an indicator to show the power is supplied normally.

2. LED2

The LED2 is an indicator to warning the USB link status. When it lights, it means USB connection works normally, otherwise it is fail.

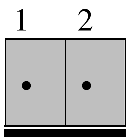
2.5 Connector and Jumper for Serial Communication

1. The connector of serial communication(J2)



To use RS422/RS485/RS232, please connect JP1 to extension board by 10 pins flat cable. (Optional)

2. Enable Serial Port (J3)



J3 is used enable serial port communication, when short the J3, means enable serial port, otherwise, when open the J3, the serial port communication is disable.

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2.6 Connector Assignments

The photo isolator input signal pin assignments are shown in the below.

Pin	Signal	Description
1	SGND	Signal Ground
2	+5V	+5V
3	IN0+	Opto-isolator Ch. 00 + Input
4	IN0-	Opto-isolator Ch. 00 - Input
5	IN1+	Opto-isolator Ch. 01 + Input
6	IN1-	Opto-isolator Ch. 01 - Input
7	SGND	Signal Ground
8	+5V	+5V

Pin	Signal	Description
1	SGND	Signal Ground
2	+5V	+5V
3	IN2+	Opto-isolator Ch. 02 + Input
4	IN2-	Opto-isolator Ch. 02 - Input
5	IN3+	Opto-isolator Ch. 03 + Input
6	IN3-	Opto-isolator Ch. 03 - Input
7	SGND	Signal Ground
8	EXT +5V	External DC +5V 3A Power In

Pin	Signal	Description
1	SGND	Signal Ground
2	+5V	+5V
3	IN4+	Opto-isolator Ch. 04 + Input
4	IN4-	Opto-isolator Ch. 04 - Input
5	IN5+	Opto-isolator Ch. 05 + Input
6	IN5-	Opto-isolator Ch. 05 – Input
7	SGND	Signal Ground
8	+5V	+5V

Pin	Signal	Description
1	SGND	Signal Ground
2	+5V	+5V
3	IN6+	Opto-isolator Ch. 06 + Input
4	IN6-	Opto-isolator Ch. 06 - Input
5	IN7+	Opto-isolator Ch. 07 + Input
6	IN7-	Opto-isolator Ch. 07 - Input
7	SGND	Signal Ground
8	+5V	+5V

CHAPTER 3

DIAGNOSTIC UNDER WINDOWS/XP

USB Test Program.exe is a diagnostic program to test your USB device under Windows/XP.

User can get USB Test Program.exe programs from Decision Studio CD.

CHAPTER 4

SOFTWARE PROGRAMMING UNDER WINDOWS/XP AND LINUX

Under Windows, we provide function library and dll file for users to program the device in supported language. You can find manual "USBDII_Manual.pdf" and demo code in VB/VC/Delphi from Decision Studio CD.

Under Linux, we provide .c source to allow user directly to access device. You can find manual and example in "dcihid-0.5.1.tgz".

APPENDIX A

WARRANTY INFORMATION

A.1 Copyright

Each piece of SmartLab package permits user to use SmartLab only on a single computer, a registered user may use he program on a different computer, but may not use the program on more than one computer at the same time.

Corporate licensing agreements allow duplication and distribution of specific number of copies within the licensed institution. Duplication of multiple copies is not allowed except through execution of a licensing agreement. Welcome call for details.

A.2 Warranty Information

SmartLab warrants that for a period of one year from the date of purchase (unless otherwise specified in the warranty card) that the goods supplied will perform according to the specifications defined in the user manual. Furthermore that the SmartLab product will be supplied free from defects in

materials and workmanship and be fully functional under normal usage.

In the event of the failure of a SmartLab product within the specified warranty period, SmartLab will, at its option, replace or repair the item at no additional charge. This limited warranty does not cover damage resulting from incorrect use, electrical interference, accident, or modification of the product.

All goods returned for warranty repair must have the serial number intact. Goods without serial numbers attached will not be covered by the warranty.

The purchaser must pay transportation costs for goods returned. Repaired goods will be dispatched at the expense of SmartLab. To ensure that your SmartLab product is covered by the warranty provisions, it is necessary that you return the Warranty card.

Under this Limited Warranty, SmartLab's obligations will be limited to repair or replacement only, of goods found to be defective a specified above during the warranty period. SmartLab is not liable to the purchaser for any damages or losses of any kind, through the use of, or inability to use, the SmartLab product. SmartLab reserves the right to determine what constitutes warranty repair or replacement.

Return Authorization: It is necessary that any returned goods are clearly marked with an RA number that has been issued by SmartLab. Goods returned without this authorization will not be attended to.

APPENDIX B

DATA SHEET

SHARP PC817 Series

PC817 Series

High Density Mounting Type Photocoupler

- ● Lead forming type (I type) and taping reel type (P type) are also available. (PC817I/PC817P)
- ●● TUV (VDE0884) approved type is also available as an option.

■ Features

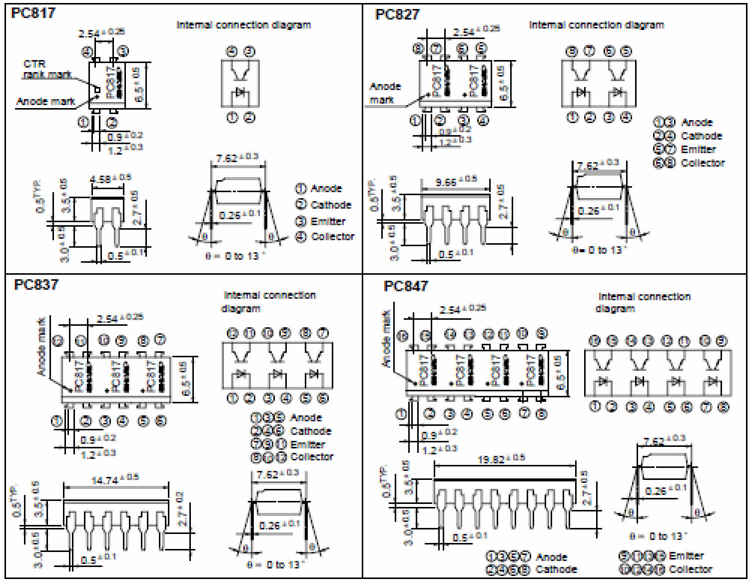
1. Current transfer ratio (CTR: MIN. 50% at I_F = 5mA, V_{CE}=5V)
2. High isolation voltage between input and output (V_{iso} : 5 000V_{rms})
3. Compact dual-in-line package
   - PC817 : 1-channel type
   - PC827 : 2-channel type
   - PC837 : 3-channel type
   - PC847 : 4-channel type
4. Recognized by UL, file No. E64380

■ Applications

1. Computer terminals
2. System appliances, measuring instruments
3. Registers, copiers, automatic vending machines
4. Electric home appliances, such as fan heaters, etc.
5. Signal transmission between circuits of different potentials and impedances

■ Outline Dimensions

(Unit : mm)



" In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that occur in equipment using any of SHARP's devices, shown in catalogs, data books, etc. Contact SHARP in order to obtain the latest version of the device specification sheets before using any SHARP's device."

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SHARP PC817 Series

■ Absolute Maximum Ratings

(Ta= 25°C)

Parameter		Symbol	Rating	Unit
Input	Forward current	I_F	50	mA
	*1Peak forward current	I_{FM}	1	A
	Reverse voltage	V_R	6	V
	Power dissipation	P	70	mW
Output	Collector-emitter voltage	V_{CEO}	35	V
	Emitter-collector voltage	V_{ECO}	6	V
	Collector current	I_C	50	mA
	Collector power dissipation	P_C	150	mW
Total power dissipation		P_{tot}	200	mW
*2Isolation voltage		V_{iso}	5 000	V_{rms}
Operating temperature		T_{opr}	- 30 to + 100	°C
Storage temperature		T_{stg}	- 55 to + 125	°C
*3Soldering temperature		T_{sol}	260	°C

*1 Pulse width <=100μs, Duty ratio : 0.001
*2 40 to 60% RH, AC for 1 minute
*3 For 10 seconds

■ Electro-optical Characteristics

(Ta= 25°C)

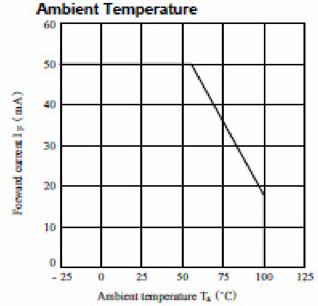
Parameter			Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input	Forward voltage		V_F	I_F = 20mA	-	1.2	1.4	V
	Peak forward voltage		V_{FM}	I_{FM} = 0.5A	-	-	3.0	V
	Reverse current		I_R	V_R = 4V	-	-	10	μA
	Terminal capacitance		C_t	V= 0, f= 1kHz	-	30	250	pF
Output	Collector dark current		I_{CEO}	V_{CE} = 20V	-	-	10^{-7}	A
Transfer charac-teristics	*4Current transfer ratio		CTR	I_F = 5mA, V_{CE} = 5V	50	-	600	%
	Collector-emitter saturation voltage		$V_{CE(sat)}$	I_F = 20mA, I_C = 1mA	-	0.1	0.2	V
	Isolation resistance		R_{ISO}	DC500V, 40 to 60% RH	5×10^{10}	10^{11}	-	Ω
	Floating capacitance		C_f	V= 0, f= 1MHz	-	0.6	1.0	pF
	Cut-off frequency		f_c	V_{CE} = 5V, I_C = 2mA, R_L = 100Ω, - 3dB	-	80	-	kHz
	Response time	Rise time	t_r	V_{CE} = 2V, I_C = 2mA, R_L = 100Ω	-	4	18	μs
		Fall time	t_f		-	3	18	μs

*4 Classification table of current transfer ratio is shown below.

Model No.	Rank mark	CTR (%)
PC817A	A	80 to 160
PC817B	B	130 to 260
PC817C	C	200 to 400
PC817D	D	300 to 600
PC8●7AB	A or B	80 to 260
PC8●7BC	B or C	130 to 400
PC8●7CD	C or D	200 to 600
PC8●7AC	A, B or C	80 to 400
PC8●7BD	B, C or D	130 to 600
PC8●7AD	A, B, C or D	80 to 600
PC8●7	A, B, C, D or No mark	50 to 600

● : 1 or 2 or 3 or 4

Fig. 1 Forward Current vs. Ambient Temperature



SHARP PC817 Series

Fig. 2 Collector Power Dissipation vs. Ambient Temperature

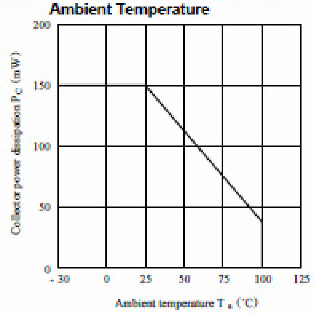


Fig. 3 Peak Forward Current vs. Duty Ratio

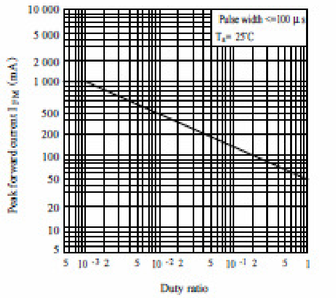


Fig. 4 Current Transfer Ratio vs. Forward Current

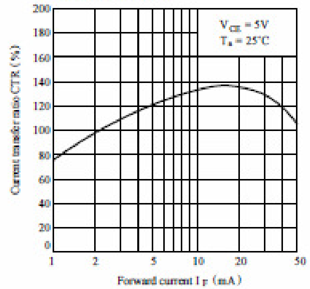


Fig. 5 Forward Current vs. Forward Voltage

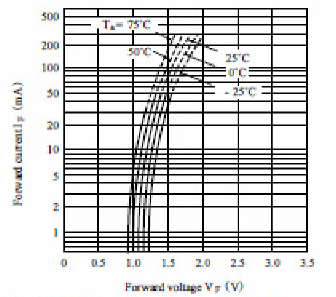


Fig. 6 Collector Current vs. Collector-emitter Voltage

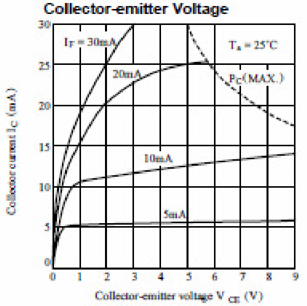
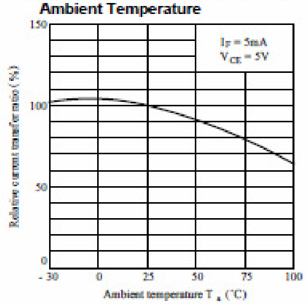


Fig. 7 Relative Current Transfer Ratio vs. Ambient Temperature



SHARP PC817 Series

Fig. 8 Collector-emitter Saturation Voltage vs. Ambient Temperature

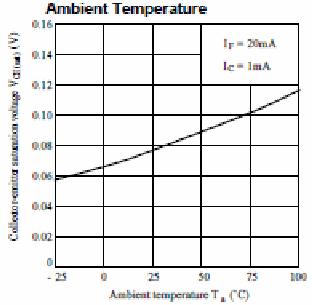


Fig. 9 Collector Dark Current vs. Ambient Temperature

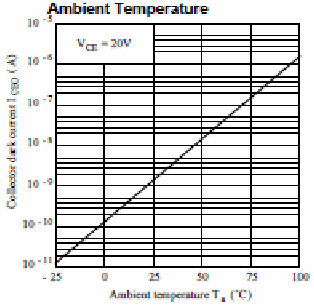


Fig.10 Response Time vs. Load Resistance

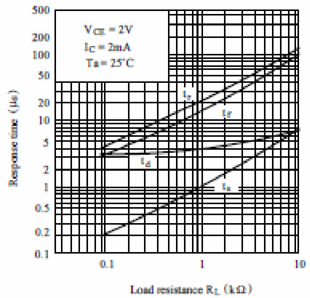
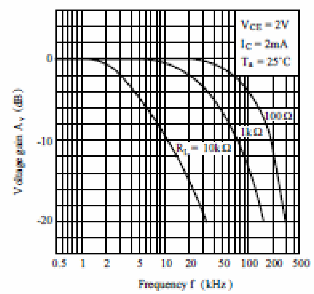
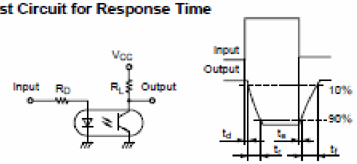


Fig.11 Frequency Response



Test Circuit for Response Time



Test Circuit for Frepuency Response

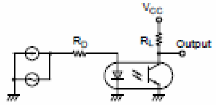
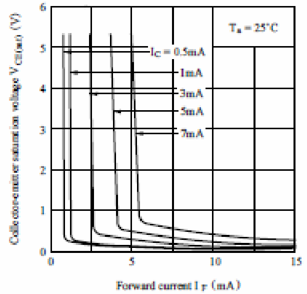


Fig.12 Collector-emitter Saturation Voltage vs. Forward Current



● Please refer to the chapter "Precautions for Use"